

E. R. KNOWLES.
TUBULAR INCANDESCENT LAMP.
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1,041,100.

Patented Oct. 15, 1912.

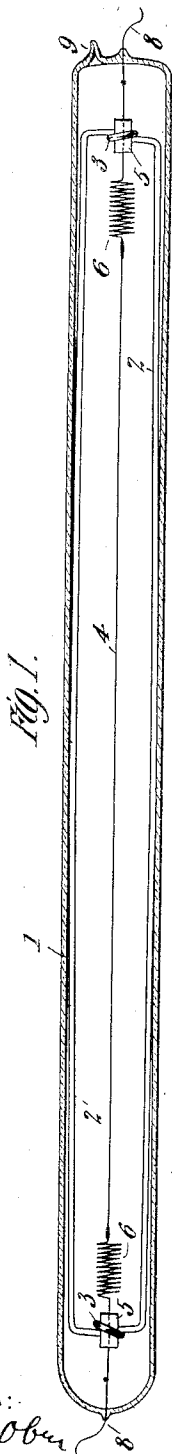


Fig. 1.

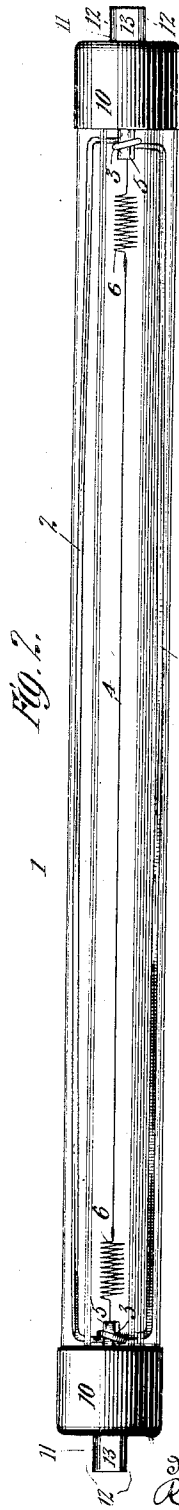


Fig. 2.

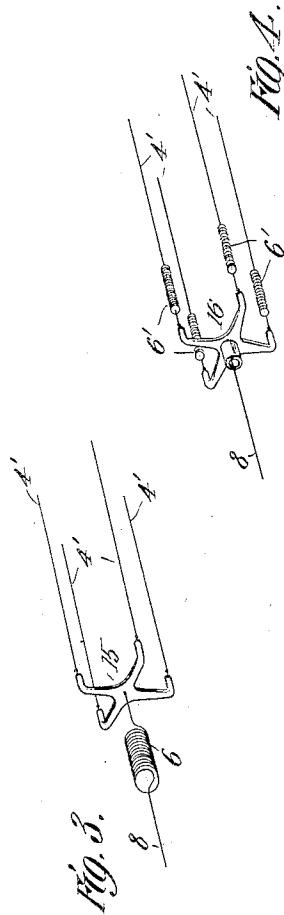


Fig. 3.

Fig. 4.

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TUBULAR INCANDESCENT LAMP.

1,041,100.

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To all whom it may concern:

Be it known that I, EDWARD R. KNOWLES, a citizen of the United States, residing at the city of New York, in the borough of Brooklyn and State of New York, have invented certain new and useful Improvements in Tubular Incandescent Lamps, of which the following is a full, clear, and exact description.

This invention relates to incandescent lamps of the class having a comparatively long straight filament axially arranged within a straight glass tube and adapted to be employed with a cylindrical reflector for certain decorative and other purposes of illumination.

I provide a construction in which the leading-in wires are sealed axially at the ends of the tube, and in which the filament is maintained centrally in the tube without depending on the uncertain support of a bent blade or wire. I also provide a construction in which the filament is carried and located by an inner frame within the glass tube, this frame having the triple functions of first, efficiently supporting or carrying the filament in a permanent axial relation within the tube, second providing for the easy insertion or assembling of the filament into the tube in the process of manufacture, and third providing a resilient or yielding support of the filament in the tube so that shocks on the tube will be cushioned in their effect on the filament. As will later appear, I also provide means by which the inner frame is prevented from casting a shadow in the use of the lamp.

With the foregoing and other objects in view my invention consists in the features of construction and combination as herein-after set forth and claimed.

In the drawings: Figure 1 is a vertical sectional view of an incandescent lamp embodying the principles of my invention. Fig. 2 is a side elevation of the same completed with the metal caps through which contact or connection is made with the supply circuit. Fig. 3 is a detail perspective view illustrating the manner in which a plurality of filaments may be employed. Fig. 4 is another modified construction for the same purpose.

Referring to the drawings in which like parts are designated by the same reference sign, 1 denotes a glass tube of the ordinary straight cylindrical form.

2 denotes an inner frame which may be constructed in different ways, but which I prefer to make in the manner shown on account of the simplicity and cheapness of this construction, and on account of the three useful functions or results which are obtained thereby as above mentioned. It comprises a wire bent into a long narrow rectangle adapted to slide into the interior of the tube 1. In accordance with my invention this inner frame is not bent into exactly rectangular form, however, but has curved sides bowing outward and ends which are shorter than the inner diameter of the tube. With this construction the frame is pressed into approximately the form of a rectangle by the walls of the tube 1 when inserted therein, the pressure insuring against any looseness in the fit. On account of the ends of the rectangular inner frame being smaller than the inner diameter of the tube, these ends are flexibly supported within the tube by the side members of said frame which bow inward at the ends of the tube in an obvious manner.

The ends of the inner frame 2 are each bent or otherwise made to form a central eye or loop 3 and in these eyes I provide means for supporting the filament 4. For this purpose I have illustrated glass plugs 5 which may be made of short pieces of tube.

6 denotes spiral springs of steel or other suitable material, the ends of which pass through the plugs 5 and are fixed thereto in any suitable manner, for example by fusing and compressing the glass tubes of which these plugs are preferably made. The filament 4 is secured to and stretched between the springs 6 in an obvious manner.

8 denotes leading-in wires which are joined to the exposed ends of the springs and which are sealed concentrically into the ends of the tube 1.

9 denotes a tubular nipple which is drawn out at one end of the tube and through which the tube is finally exhausted of air or other gas which may be employed in manufacture. This nipple is subsequently sealed up.

The foregoing construction has several advantages both in its method of manufacture and in its practical use. It will be observed that the filament is adapted to be associated in this permanent relation on the inner frame 2 before the latter is inserted in the tube 1, and when so organized with its

supporting inner frame, it does not require any great delicacy in handling as would be the case with an unsupported filament. The delicate manipulation where the filament is directly handled is therefore completed at the initial stages of the manufacturing processes, as is obviously desirable. The subsequent steps of the manufacture require comparatively slight skill; the lamp is therefore adapted to be made about as cheaply as any incandescent lamp.

In use the filament is stretched by the springs 6 within the frame 2 and the latter is by its nature held in a diametrical or axial plane of the tube 1. The accuracy of this adjustment is dependent upon nothing except the proper location of the eyes 3 in the frame 2, and the latter may be cheaply and accurately made in a die press. The springs being flexible necessarily pull the filament in exact alinement with the plugs as long as any tension remains therein, and as I make them with a number of convolutions, it is certain that they will retain sufficient tension in spite of long continued usage.

10 denotes metal caps cemented or otherwise fastened to the ends of the tube 1 after the latter has been sealed and completed as shown in Fig. 1. These caps are electrically connected to the leading-in wires and therefore constitute terminals of the lamp. In order to avoid the inner frame 2 casting a shadow in use, I make the caps 10 with square extremities 11 which are enameled on two opposite side faces 12. This leaves only a pair of exposed metal side faces 13, adapted to be engaged by the usual fastening clips of the holder, which accordingly insures the positioning of the tube in the particular axial plane of these faces. This plane corresponds to such a disposition of the inner frame 2 that no shadow is cast in the use of the device.

In Fig. 3 a star or yoke 15 is attached to the spring 6 at each end of the inner frame 2 and a plurality of filaments 4' stretched between the arms of these stars or yokes.

In Fig. 4 similar stars or yokes 16 are employed but are in this case directly secured to the plugs 5 and have individual springs 6' at the extremity of each arm to which the filaments are attached. This latter construction has the advantage of insuring tension of the filaments regardless of unequal expansion, or variation in length from any cause.

What I claim, is:—

1. In an incandescent lamp, the combination of a tube, a filament holder therein in the form of a frame having outwardly tensioned resilient side members engaging at an intermediate point the walls of the tube, the extremities of the frames being flexible

and out of contact with the tube, and a filament attached at its ends to the frame.

2. In an incandescent lamp, the combination of a tube, a filament holder therein in the form of a frame having outwardly tensioned resilient side members engaging at an intermediate point the walls of the tube, the extremities of the frames being flexible and out of contact with the tube, a filament extending longitudinally of the frame, and springs in alinement with the filament and connecting the extremities thereof with the extremities of the frame.

3. An incandescent lamp comprising a straight cylindrical tube, a rectangular resilient inner frame with outwardly bowed sides received within said tube, and a filament wholly supported by said frame coaxially within said tube.

4. An incandescent lamp comprising a straight cylindrical tube, a rectangular resilient inner frame with outwardly bowed sides received within said tube, a filament wholly supported by said frame coaxially within said tube, and means for maintaining said filament stretched under tension within said frame.

5. An incandescent lamp comprising a straight cylindrical tube, an inner rectangular wire frame having ends shorter than the inner diameter of the tube and outwardly bowed sides, and a filament wholly supported by said frame within said tube.

6. An incandescent lamp comprising a straight cylindrical tube, a wire frame having eyes at its ends and supported within said tube, springs having their terminal ends passing through said eyes and supported by said frame, and a filament stretched between said springs.

7. An incandescent lamp comprising a straight cylindrical tube, a rectangular frame having eyes at each end, glass plugs in said eyes, springs secured to said plugs, and a filament stretched between said springs within the frame.

8. An incandescent lamp comprising a straight cylindrical tube, a rectangular frame having eyes at each end, glass plugs in said eyes, springs secured to said plugs, a filament stretched between said springs, and leading-in wires coaxially sealed through the ends of said tube.

9. In an incandescent lamp, the combination of a tube, a frame held stationary at an intermediate point in the tube and having its ends free therefrom, a filament extending longitudinally of the frame, anchoring means on the extremities of the frame, tensioning conductors connected with the filament and extending through the anchoring means, and leading-in wires connected with the said conductors at points between the frame and extremities of the tube.

10. In an incandescent lamp, the combination of a tube, a frame extending in the tube and held in place by portions being tensioned against and frictionally engaged
5 with the tube, a filament extending longitudinally of and shorter than the tube, springs connected with the ends of the filament and forming conductors, means for fastening the springs on the frame, and leading-in wires
10 connected with the springs.

11. In an incandescent lamp, the combination of a tube, a frame held stationary therein with its extremities laterally resilient and out of contact with the tube, a filament
15 extending longitudinally of the frame and having its extremities connected with the frame and subjected to a longitudinal tension, and leading-in wires connected with the filament and arranged to permit freedom
20 of movement of the extremities of the frame.

12. In an incandescent lamp, the combination of a tube, a frame extending longitudinally therein, a filament shorter than and
25 extending longitudinally of the frame, springs sustaining the filament and exerting a longitudinal tension thereon, anchoring devices carried by the frame and through which the springs extend for securing the
30 springs to the frame, and leading-in wires connected with the springs whereby the latter are in series with the leading-in wires and filaments.

13. In an incandescent lamp, the combination of a tube, a frame mounted thereon with its extremities disposed inwardly from the ends of the tube, a filament shorter than and extending longitudinally of the frame,
35 conductors connected with the ends of the filament and extending beyond the extremities of the frame, means for anchoring the conductors on the frame, the portions of the conductors between the filament and points of anchorage on the frame being resilient
40 to subject the filament to a longitudinal tension, and leading-in wires connected to the said conductors between the ends of the frame and ends of the tube.

14. In an incandescent lamp, the combination of a tube, a structure mounted therein,
50 conductors extending into the structure from the ends thereof, tubular members fastened

to the ends of the structure and in which the conductors are sealed, the portions of the conductors within the structure being
55 resilient, and a filament sustained wholly by and electrically connected with the resilient portions of the conductors and held under longitudinal tension thereby, and leading-in
60 wires connected with the conductors.

15. In an incandescent lamp, a filament supporting frame comprising a structure having resilient side members yieldable inwardly for insertion in a bulb.

16. In an incandescent lamp, a filament
65 supporting frame comprising a structure having resilient side members yieldable inwardly for insertion in a bulb, a filament extending longitudinally of the frame between the said members, and means for attaching
70 the extremities of the filaments to the frame, said means comprising a conductor anchored on the frame and having a resilient portion connected with the filament for exerting a longitudinal tension thereon.
75

17. In an incandescent lamp, the combination of a comparatively long wire rectangular frame having resilient side members yieldable inwardly for insertion in a bulb, tubular
80 members anchored on the extremities of the frame, conductors extending through and sealed in the said members with portions extending inwardly and outwardly from the latter, the inwardly-extending portions being
85 formed into springs, and a filament electrically connected with and sustained by the spring portions of the said conductors.

18. In an incandescent lamp, a filament-supporting frame, conductors extending into the frame from the extremities, members in
90 which the conductors are sealed, means on the frame for fastening the conductors thereto, the portions of the conductors extending inwardly from the said members being formed into helical springs, and a filament
95 electrically connected with the conductors and held under longitudinal tension thereby.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

EDWARD R. KNOWLES.

Witnesses:

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WILLIAM C. LARY.